LESSON MAKER PRO

Circle Ratio Quest

Use unit-circle coordinates to find four trig functions.

HIGH SCHOOL · MT.PLUS.ALG.TRIG.1.b

MT.PLUS.ALG.TRIG.1.b "Understand how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers by: Defining the tangent, cotangent, secant, and cosecant functions in terms of sine and cosine."

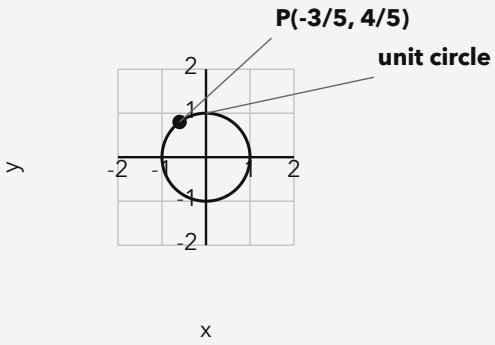
NAME _____ DATE _____

COORDINATES TO RATIOS

For a point on the unit circle at angle t, its coordinates are (cos t, sin t). Use tan t = sin t/cos t and cot t = cos t/sin t; use sec t = 1/cos t and csc t = 1/sin t. A function is undefined when its denominator is 0.

WORKED EXAMPLE

At point P on the unit circle, find tan t and sec t.

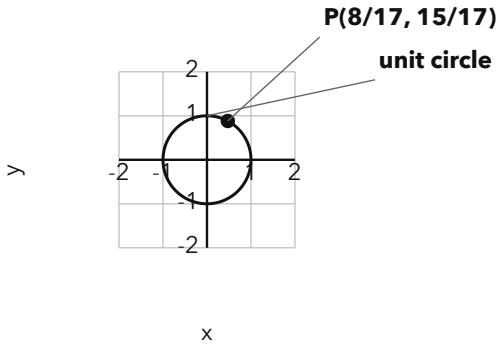


1. Read cos t = -3/5 and sin t = 4/5.
2. tan t = (4/5)/(-3/5) = -4/3.
3. sec t = 1/(-3/5) = -5/3.

Answer: tan t = -4/3; sec t = -5/3

PRACTICE 6 problems

1 At point P on the unit circle, find tan t and sec t.

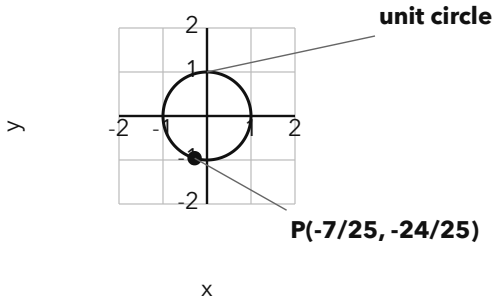


ANSWER _____

2 If sin t = -12/37 and cos t = -35/37, find cot t.

ANSWER _____

3 At point P on the unit circle, find cot t and csc t.

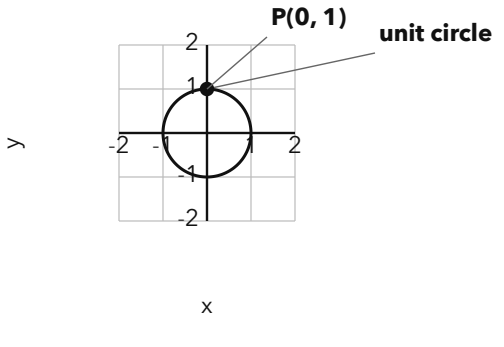


ANSWER _____

4 If sin t = -9/41 and cos t = 40/41, find tan t.

ANSWER _____

5 At point P on the unit circle, find cot t and sec t. If either is undefined, say so.



ANSWER _____

6 If sin t = 28/53 and cos t = -45/53, find sec t and csc t.

ANSWER _____

APPLY IT Show your work

1 A game's virtual joystick reports its position on a unit circle as (63/65, -16/65). For its angle t, find cot t and csc t.

WORK SPACE

ANSWER _____

2 In a video editor, a sticker follows a circular path. Its unit-circle position is (-11/61, -60/61). For its angle t, find tan t and sec t.

WORK SPACE

ANSWER _____

CHALLENGE One step up

At a point on the unit circle, tan t = -13/84 and cos t < 0. Find sec t and csc t. Explain how you chose their signs.

WORK SPACE AND ANSWER

ANSWER KEY

Circle Ratio Quest

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	At point P on the unit circle, find tan t and sec t.	**tan t = 15/8; sec t = 17/8**
2	If sin t = -12/37 and cos t = -35/37, find cot t.	**35/12**
3	At point P on the unit circle, find cot t and csc t.	**cot t = 7/24; csc t = -25/24**
4	If sin t = -9/41 and cos t = 40/41, find tan t.	**-9/40**
5	At point P on the unit circle, find cot t and sec t. If either is undefined, say so.	**cot t = 0; sec t is undefined**
6	If sin t = 28/53 and cos t = -45/53, find sec t and csc t.	**sec t = -53/45; csc t = 53/28**

PART 2 · APPLY IT

1. **cot t = -63/16; csc t = -65/16** Use cos t = 63/65 and sin t = -16/65. Divide cos t by sin t for cot t, then take the reciprocal of sin t for csc t.
2. **tan t = 60/11; sec t = -61/11** Divide sin t = -60/61 by cos t = -11/61 to find tan t. Take the reciprocal of cos t to find sec t.

CHALLENGE

sec t = -85/84 and csc t = 85/13. Since cos t < 0 and tan t < 0, sin t > 0. The 13-84-85 triangle gives cos t = -84/85 and sin t = 13/85.

Accept equivalent simplified fractions. Sec t is undefined when cos t = 0.